"A STUDY OF EFFECTIVENESS OF CONCEPT MAPPING AND PEER GROUP DISCUSSION STRATEGY ON STUDENTS LEARNING OUTCOMES IN SCIENCE"

''विज्ञान विषय में विद्यार्थियों के अधिगम निष्पत्ति पर सम्प्रत्यय मानचित्र एवं समूह परिचर्चा विधियों की प्रभावशीलता का एक अध्ययन''

A

SYNOPSIS

SUBMITTED TO THE

MAHARSHI DAYANAND SARASWATI UNIVERSITY, AJMER

FOR THE DEGREE

OF

DOCTOR OF PHILOSOPHY

IN

EDUCATION

Research Scholar

Deepti Peter

Under the Guidance of

Dr. Suman Bala

(Lecturer)

H.B.U. Teachers College for Women, Hatundi, Ajmer

MAHARSHI DAYANAND SARASWATI UNIVERSITY, AJMER

2017

CERTIFICATE BY SUPERVISOR

Certified that:

1. I am willing to guide the research work of Mrs. Deepti Peter on the above subject if he registered for Ph.D.
2. To the best of my knowledge the subject selected has not been studied so far in any university.
3. The subject is of sufficient scope to keep the candidate engaged for two years.
4. The subject will lead to a valuable contribution. I have seen and approved the outline and bibliography, etc. submitted by the candidate.
5. Necessary facilities are available in the department for the above research work (Certificate from Principal/Head University Department with regards to facilities available is enclosed).
6. I have Research candidate registered under my supervision and the serial no. of this candidate whose application being forwarded registration is 04 (Four)
7. The candidate is not a close relation (the term close relation is defined in examination ordinance of the university).

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Signature of the Supervisor with date

Certified that the available facilities will be extended to Mrs. Deepti Peter for research work if he registered for Ph.D.

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APPENDIX-IV

1. **Name of Scholar** :
   - **(In English)** - **Deepti Peter**
   - **(In Hindi)** - दीप्ति पीटर
2. **Title of Research Work** :
   - **(In English)** **"A STUDY OF EFFECTIVENESS OF CONCEPT MAPPING AND PEER GROUP DISCUSSION STRATEGY ON STUDENTS LEARNING OUTCOMES IN SCIENCE"**
   - **(In Hindi)** ''विज्ञान विषय में विद्यार्थियों के अधिगम निष्पत्ति पर सम्प्रत्यय मानचित्र एवं समूह परिचर्चा विधियों की प्रभावशीलता का एक अध्ययन''
3. **Location** :
   (a) Institution / Department where the work is to be done : **H.B.U. Teachers College for Women, Hatundi, Ajmer**
   (b) Geographical area of investigation : Ajmer District
4. Introduction importance of proposed Investigation, Objective.
5. Review (Work already done on the subject of proposed Research Study.)
6. Research Gaps identified in the proposed field of investigation (Based on the review)
7. Major Hypothesis, if any
8. Research methodology
9. List of reference cited

DPJoseph

Signature of the Candidate

Outline Approved

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1. INTRODUCTION,IMPORTANCE OF PROPOSED INVESTIGATION, OBJECTIVES

1.1 INTRODUCTION

Science is the pursuit and application of knowledge and understanding of the natural & social world following a systematic methodology based on evidence. Science denotes such a very wide range of activities a definition of it needs to be general; it certainly needs to cover investigation of the social as well as natural words "systematic" and "evidence" and it needs to be simple and short. The definition succeeds in all these respects admirably and applied it therefore (AC Grayling 2009) generally like any other subject upto the secondary level of education. Science is also being taught mainly through conventional method in our classroom. However, the students of present context find it very difficult to engage themselves in the learning of basic concepts of science. The teaching of science is a tricky business covering a range of aims from the development of conceptual understanding and inquiring skill to the fostering of positive attitudes towards science and scientific literacy. Enthusiasing children capturing their creative ideas and challenging them expertise commitment, subject knowledge and time, of course in the tight schedules of school life, science can get squeezed and so teachers require efficient, exciting and thoughtful practices in order to succeed with pupil.Hence a reform in the teaching & learning of science is needed which can help students to learn more effectively and practically. One way to fulfill this demand is to use the various effective strategies like one way of the strategy concept mapping is very effective strategy. Concept mapping is method by which facts and experiences can be integrated and remain impress in the mind much longer than facts. Concept mapping is a method to visualize the structure of

knowledge.Visual representations also allow the development of a holistic understanding that words alone cannot convey because the graphical form allows representation of part and whole in way that is available in sequential structure of text(Laws on 1994).The principle of a concept map is that it provides a visual means of showing connections and relationships between a hierarchy of ideas ranging from very concrete to the abstract. "Helping children learn concept and teaching them how to learn concept is a fundamental purpose of schooling. Constructivist approaches to teaching and learning science emphasis deep understanding of concept (as opposed to memorization)discussion, explanation and exploration to students' implicit knowledge." According to Will and Joyce 1978.Concept maps can improve understanding of science concepts and help to build connections among abstract concepts.The other way in which teachers are encouraged to work is through the use of peer group talk which is seen an important dynamic and creative context for science learning popular with teachers and pupil (Howe and Tolmie 2003).

"Learning is enhanced when it is more like and team effort than solo race. Good learning like good work is collaborative and social noncompetitive and isolated. Sharing one ideas and responding to others improves thinking and deepens understanding." (Wiersema 2000). Peer group discussion method is a one way of cooperative learning. It helps to actively engage students in the learning process and seek to improve the critical thinking reasoning and problem-solving silks of the learner.

In traditional method of science is taught mainly through lecture method and class is dominate by teacher which is not fulfill the curiosity of students. Here the teacher role is active and students are the passive participants. Students are expected to memorize or rote the facts. Thus, to develop scientific attitude,

scientific temper and scientific literacy, concept mapping and peer group discussion strategies plays avital role.

1.2 IMPORTANCE OF PROPOSED INVESTIGATION

Education aims at making children capable of becoming responsible, productive and useful member of society. Knowledge skills and attitude are built through learning experiences and opportunities create for learner in school. It is in the classroom that learners can analysis and evaluate their experiences, learn to doubt, to question to investigate and to think independently. Since the down of learning traditional teaching in our school is teacher center and authoritarian. Here the teacher role is active and the students are passive participants. The students are expected to memorize the information and reproduce then in the examination, which hindered the overall growth of the children. According to J.K. Sood (Science teaching) Contemporary school science education suffers from various differences, generally science is presented by the science teacher to students as the narration of facts in this process students only memorized facts in science. In the developing countries where is inadequately emphasis on the development of scientific literacy, scientific temper and scientific attitude. Though these objectives have been clearly mentioned in the national policies of education. (National Policy of Education 1986 & National Curriculum Framework 2005). In all streams and particularly in science thus the aim of education must reflect the current need and aspiration of our society. Learning must be paced so that it allows learner to engage with concepts and deepen understanding rather than remembering the facts and concepts only to forget after the examination at the same time. Learning must provide variety and challenge and be interesting and engaging. NCF 2005 stated in position paper on teaching in science that "In a progressive looking forward society science can play a truly liberating role helping people out of the vicious

circle of poverty, ignorance and superstitious and a democratic political framework work the possible abrasion and misuse of science can be checked by the people themselves. Science temper with wisdom is the surest and the only way of human welfare." One way to fulfil the need of human society and particularly in science the effective methods of teaching, learning process become unavailable. Among various strategies of concept mapping and peer group discussion are fulfilling the need of the days.

Concept mapping is based on ausubel's theory of meaningful verbal learning is currently a favorite subject of research in western world. Concept maps are diagrammatic representation which shows meaningful relationship between concept in the form of propositions which are linked together by word, circle and cross link. Concept are linked hierarchically in which the super ordinate concept at the top of the map and subordinate at the bottom which are less inclusive than higher ones.

Peer group discussion refers to focused and structured cognitive & meta cognitive process of deep examination, evaluation, analysis and query of a learning experiences or critical incident which result in transformation of the mind e.g. new appreciations in sight context utilization, change perspectives and beliefs and translational actions such as new way of doing thing search for further understanding etc. Concept mapping and peer group discussion may help learners to help develop cognitive psychomotor and affective skill, to lay emphasis on thought process and deemphasis memorization, to enables the students to demonstrate to others his/her learning & progress, to provide opportunities to explore, observe, collect data, analysis, organize and interpret data & raw generalization, to develop a positive attitude towards group work sharing and learning from each other, to enable students with a wealth of information across

different developmental areas, to develop respectful, cooperative and helpful behavior, to develop confidence and other skills in students, to demonstrate their ideas and thought in positive manner, to develop aptitude of self-evaluation and self-conceptualization, to develop scientific literacy, scientific temper & scientific attitude among students, to develop practical & factual approach among students rather than memorizing the facts.

1.3 OBJECTIVES OF THE STUDY

1. To study of effectiveness of concept mapping strategy on cognitive aspect of VIII class students.
2. To study of effectiveness of concept mapping strategy on non- cognitive aspect of VIII class students.
3. To study of effectiveness of peer group discussion on cognitive aspect of VIII class students.
4. To study of effectiveness of peer group discussion on non-cognitive aspect of VIII class students.
5. To study the effect of independent variables (gender, SES, parent education, caste) on students cognitive aspects while using different teaching learning strategies.
6. To study the effect of independent variables (gender, SES, parent education, caste) on students non- cognitive aspects while using different teaching learning strategies.
7. To study the relationship of effectiveness of concept mapping and peer group discussion strategy on cognitive aspects of VIII class students.
8. To study the relationship of effectiveness of concept mapping and peer group discussion strategy on non-cognitive aspects of VIII class students.

2.REVIEW OF WORK ALREADY DONE ON THE SUBJECT OFPROPOSED RESEARCH STUDY

2.1 REVIEW OF LITERATURE RELATED TO CONCEPT MAPPING

- **Ezeudu; Florence Obiageli (2003):-"** Influence of concept maps an achievement Retention of senior secondary school students in organic chemistry". The purpose of the study was to assess the influence of concept maps and lecture teaching methods on students' achievement. Means scores and mean retention scores in organic chemistry was calculated. Design of this study was quasi- experimental study design. It is pre test –posttest nonequivalent control group design. The result of this study is in line with the assertion of Ausubel in his cognitive theory that concepts are learned not by rate but by meaningful learning.
- **Rao (2009)** used concept map to facilitate middle level (eight grade) students learning of science content- study indicate that the concept mapping is an effective tool for aiding student comprehension and internalization of science material students using concept maps scored higher on post-test than students receiving more traditional types of instruction.
- **Aruna (2010)** found that "concept mapping can be used as a tool for revision and knowledge internalization tool". The teachers in the field of teaching primary level general sciences can use the concept mapping and encourage students to draw concept maps an their own, understand the level of achieving the learning competencies, identify the students who are lacking particular concepts, fill the gaps in the quest for their knowledge and make teaching and learning of science an enjoyable and memorable process.

- **Ajaja 0. Patrick (2011)** "studied concept mapping as a study skill: effects a students Achievement in Biology". The purpose of the study was to determine if the use of concept mapping as study skill can influence students achievement in biology. The design of the study was quasi – experimental pre-test- Posttest control group design. The major instruments used for data collection was biology and an interview schedule to determine the students perceptions of the usefulness of concept mapping in their studies. All the students interviewed agreed that concept maps helped them to determine relationship among concept, sharpened their understandings and increased their critical thinking. It was concluded that concept mapping could serve as an appropriate alternative for studying biology since what is learned through it can be retained for a long time.
- **Dominic T. Polancos (2012)** "studied on effect of vee diagram and concept mapping on the achievement of students in chemistry. It follows a quasi-experimental and non-equivalent comparison group approach. Result shows that vee diagram and concept map helps students develop a rich system of concept and their learning strategies that simulate learners not only to use concept that have already internalized but also to build conceptual inter connections. The conceptual inter connection that helps students formulate theoretical explanations about observed changes. The finding points to the importance of emphasizing connections between concepts in high school chemistry instruction.
- **Kanak Sharma(2013):** Studied "effect of concept Mapping strategy on concept Retention and concept attrition in organic chemistry". This research was conducted by Kanak Sharma using experimental study which was conducted to compare the effect of concept mapping strategy and conventional teaching method on student concept retention and concept

attrition. The objectives of the study were to find the effectiveness of concept mapping strategy in comparison on the conventional method. Result of this study was the concept mapping strategy has a positive effect on the achievement and concept retention in organic chemistry of students belonging to experimental group.

- **Kitik Mustafa (2013)**:- concept Mapping as a tool for meaningful learning in chemistry Education. Teaching method and tool should transform knowledge from short term memory to long term memory concept mapping is one of the best teaching and learning tools that encourage meaningful learning.
- **Dr. Jaya Chawala & Dr. Gurmit singh (2016)** "effect of concept mapping strategy on Achievement Chemistry Among IX grade girls". The study was carried out investing the effort of teaching through concept mapping on the achievement in chemistry among girls. Sample of study consisted of 118 girls (59 experimental group and 59 controlled group) of IX class from two government schools of Ludhiana city. Result of this study supported that concept mapping is useful for girls in teaching chemistry concepts.

2.2 REVIEW OF LITERATURE RELATED TO PEER GROUP DISCUSSION

- **Fisher (1968)** conducted an experiment in which one group of fifth grade students read a series of stories designed to promote positive attitudes towards American Indians. Another group of students read the same stories and in addition participated in a discussion after each reading period, students in the discussion group developed significantly more positive attitudes towards American Indians than did the students who only read the stories.

- **William Hill (1969)** has developed a variant of the discussion method for achieving goals relating to subject matter mastery. After students have read or viewed same curriculum material the teacher conducts a discussion that includes these points: - terms and concepts in the curriculum selection, the author's message major themes and subtopics, relationship of the material to other knowledge, applications of the material and evaluation of the author's presentation subject matter mastery discussion, analysis application, synthesis and evaluation levels of the cognitive objectives.
- **Gall and Gall (1976)** found that discussion group are more effective than individuals in solving problems which "require students to draw on the diverse talents of their peers, which have multiple & solutions and which will commit students to course of action."
- **Wells (1989)** found that the success of discussion lying not on increasing the amount of student talk but in enhancing the quality of the talk. Effects varied by students 'academic ability' The approaches exhibited greater effects when employed with above – average student. It appears that above average ability students could understand a text and think in dependently about the pronounces of meaning even without participating in discussion.
- **Almasi (1994)** found that students, led discussions can enabled students to collectively explore topics more fully and to have more control and Interpretive authority.
- **Wieneck and o' Flahavan (1994):** - indicate that smaller groups are better but they should not be so small as to limit the diversity of ideas necessary for productive discussions.
- **Fall Webb and Chu-Dowsky (2000)** analysed IX grade student's performance on language arts tests in which student either discussed or did

not discuss a story they were required to read and discuss a story they were required to read and interpret. Results showed that allowing students to engage in a 10-minute discussion of the story in three person groups was positively related to student's understanding of the story.

- **Murphy et al (2007)** conducted a meta-analysis of quantitative studies that provided evidence of the effects of different approaches to text – based discussion a measure of teacher and student talk and/or of individual student comprehension and reasoning outcomes. There was single group pre-test – post-test design studies and multiple group studies. Result finding was the approaches to discussions differentially promoted high level comprehension of text.
- **Ametta Tsang (2011)** In class reflective group Discussion as a strategy for the Development of students as Evolving professionals. The primary aim of this study was to determine perceptions of three cohorts of third year undergraduate students (n=6s) on in class reflective group discussion as a critical reflective approach for evolving professionals. The key benefits of reflective group discussions perceived by students included peer learning peer and / or tutor support and multi-perspective critical thinking students invoked that reflective writing and reflective group discussions were beneficial in different ways. The Interactive, supportive and Multi-perspective nature of reflective group discussion was particularly appealing to students.
- **Elizabeth Hewitt2016):-**" Teachers thinking about and using peer group Discussion in Primary science."Through this research researcher have tried to establish a theoretical basis for exploring participant thinking as a way of gaining understanding learning of science through the use of group talk the positive impact of a range of intervention studies, understanding pupil and

teacher thinking about talk and how it is routinely used seems to have a role in developing a broader understanding of how to promote the use of class room practice which involves pupils in discussion.

3. RESEARCH GAPS IDENTIFIED IN THE PROPOSED FIELD OF INVESTIGATION

After review of literature studied by researcher no study was undertaken on "effectiveness of concept mapping and peer group discussion strategy on students learning outcomes in science". Hence it created the need to conducted research and generate factual evidence about effectiveness of above mentioned strategies on secondary school students.There is a need to develop more rational and practical knowledge among students to develop a welfare and idealistic society. Thus, to fulfill the need of the time concept mapping and peer group discussion on students learning outcome in science may be play a critical role.Till date all the review of literature and research work focused only on student's achievement in subject, retention, scientific literacy which only based on cognitive aspect of learning. Here the researcher will study on both major constructivist methods i.e. concept mapping and peer group discussion and its effect on cognitive and non-cognitive aspects of learning.The study will assist teachers and mentors to understand basic needs and problems of students in present scenarioand helped the students to know their potential and to develop positive attitude in any circumstances.

4.MAJOR HYPOTHESES

HYPOTHESES OF THE STUDY

To achieve objectives of the study following hypotheses will be formulated and will be tested corresponding to the objectives:

1. There will be no significant difference between effect of concept mapping and conventional teaching strategy on cognitive aspects of students.
2. There will be no significant difference between effect of concept mapping and conventional teaching strategy on non - cognitive aspect of students.
3. There will be no significant difference between effect of peer group discussion and conventional teaching strategy on cognitive aspects of students.
4. There will be no significant difference between effect of peer group discussion and conventional teaching strategy on non -cognitive aspects of students.
5. There will be no significant difference in effect of independent variables on student's cognitive aspects while using different teaching learning strategies.
6. There will be no significant difference in effect of independent variables on students non -cognitive aspect while using different teaching learning strategies.
7. There will be no significant relationship between effects of concept mapping and peer group discussion strategy on cognitive aspects of students.
8. There will be no significant relationship between effects of concept mapping and peer group discussion strategy on non- cognitive aspects of students.

5. MATERIAL AND METHODS/RESEARCH METHODOLGY

5.1AN OPERATIONAL DEFINITIONS OF KEY TERMS

- **Concept Map:** A concept map is a type of graphic organizer used to help students organize and represent knowledge of a subject.
- **Peer Group:** A peer group is both a social group and a primary group of people who have similar interest, age, background or social status.
- **Strategy:** Teaching strategy is a generalized plan for a lesson which includes structure, desired learner behavior in term of goals of instruction and an outline of planned tactics necessary to implement the strategy. The lesson strategy is a part of a larger development scheme- the curriculum E-stones & S. Morris.
- **Learning Outcomes:** Learning outcomes are statements that describe significant and essential learning that learners have achieved and can reliably demonstrate at the end of a course or program. In other words, learning outcomes identify what the learner will know and be able to do the end of a course or program.
- **Discussion:** The action or process of teaching about something in order to reach a decision or to exchange ideas.

5.2 RESEARCH DESIGN METHODOLOGY:

The study will be experimental in nature. This part will be divided in three phases:

1.Pre-experimentation phase- in this phase following work will be comprised of-

Selection of the sample –a group of 60 students of VIII class will be selected from the secondary/ sr. secondary schools for the study of effectiveness of concept mapping and peer group discussion on cognitive and non-cognitive aspects of students.

The selected sample will be divided in three groups as –

Experimental group – For concept mapping strategy and peer group discussion strategy (20 -20 Students)

Control group – Traditional method (20 students)

Pre – Testing – All the selected sample of experimental and control group will be pre-tested by using self-made achievement test prepared on content already completed by the students and using standardized instruments i.e. self-concept, self confidence level, social acceptability among peer, social competence test, scientific attitude scale.

2. Experimentation Phase: - The researcher will execute her different teaching-learning strategies i.e. concept mapping and peer group discussion on experimental group and traditional method on control group. The process will take 3-4 months to execute research program to study the effectiveness of strategies among VIII class students.

3. Post- Experimentation Phase: -Post testing – After successful completion of experimentation research researcher will organized post-test of experimental and control group by using self-made achievement test for cognitive aspect and various

standardized test (self-concept, self-confidence, scientific attitude, social acceptability among peers) to collect information about post data of effectiveness of concept mapping and peer group discussion on learning outcome of students.

5.3 SAMPLE

The researcher will select a suitable size of sample by employing convenience sampling technique for the present study in about 60 students of class VIII. Where the adequate number of students in class VIII available and concerned H.M willing to permit the enhancement program and member of staff also co-operate for experimentation will be taken. The intact students will make equated based on their previous achievement to make homogenous group. Based on self- made achievement test the students will be divided into two groups.

1. The control groups
2. The experimental group

5.4 TOOLS TO BE USED

IN the present study, the following tools and techniques will be used to collect the necessary and quantitative data;

A)To assess non cognitive learning outcomes of students self-made achievement test will be apply on students before start the treatment and after the treatment [control group and experimental group]

B) To evaluate non-cognitive achievement of students standardized tools will be apply

1 self confidence level test - constructed by Rekha Gupta

2 self-concept test-constructed and standardized by-Mukta Rani Rastogi. Lakhnow

3.social acceptability Among Peers of S.l CHOPRA

4.Scientific attitude scale; Sukhawant bajwa, Monika Mahajan

5.5 STATISTICS OF ANALYSIS

On basis of all data receive mean, S.D, Co-efficient,Co-relation, t- testandF- test will be applied for statistical analysis of gather data.

Background Variable

Dependent Variable: - Cognitive and Non-cognitive aspect of students.

Independent Variable: - Gender, SES, Parent education and Caste.

5.6 DELIMITATION OF THE STUDY

The purpose of the research is to derive out the learning outcome of both cognitive and non-cognitive aspect of students. To derived out an accurate data, it become inevitable to delimit the focus of the study. The present research study will be delimited to mentioned objectives 1 to 8.the study will be confined upto the researcher's ability, effort and resources. The expected findings of the study will be based on analysis and statistical testing of hypothesis assumed.

5.7 SCHEME OF CHAPTERIZATION

The objectives, hypothesis, methodology and findings in brief have been discussed in this synopsis. The review of related literature, methodology in detailed data analysis, interpretation of findings, effectiveness of teaching strategy in learning outcomes will be discussed in detail in thesis.The thesis will be presented in five chapters such as;

Chapter 1; identification of the problem, defining concepts, basic introduction of the study, objectives and hypothesis.

Chapter 2; The second chapter will deal with Review of Related Literature.In the second chapter, the researcher will carry review of other related study

Chapter3; The third chapter will deal with base of research and research design, tool and statistical techniques

Chapter4; The fourth chapter will deal with process of collection, analysis and interpretation of data in the fourth chapter the researcher will bring out the qualitative and quantitative analysis of the study on the basis of the data collected.

Chapter 5;The fifth chapter will deal with findings,conclusion and suggestion.In the fifth chapter, the researcher will bring out final findings and conclusion of the study, further researcher,ideas about the new areas of research.

6. REFERENCES

1. *Sharma, Kanak (2013): Effect of Concept Mapping Strategy on Concept Retention & Concept Attrition in Organic Chemistry, Journal of Indian Education, Volume XXXVIII No. 4 Page No 25-43*
2. *Aruna, 2010: Concept Map as Revision Tool, Edu Track Volume 10 No. 4.*
3. *Mustafa, Kitic (2013): Concept Mapping as a Tool for Meaningful Learning in Chemistry Education, Vol. 12 No. 8*
4. *Novak, JD (1990): Concept Mapping a Useful Tool for Science & Education, Journal Research in Science Teaching 27:937-949*
5. *Ajala, OP (2011): Concept Mapping as a Study Skill Effect on Students Achievement in Biology, Int J Education Science 3(1):49-57*
6. *NCERT (2000): National Curriculum Framework for School Education: A Discussion Documents NCERT New Delhi.*
7. *Sharma, Santosh (2006): Constructivist Approaches to Teaching and Learning Handbook for Teachers of Secondary Stage, NCERT New Delhi.*
8. *Srinivas,K(2013)" Effectiveness of Constructivist Approach on The Achievement in Science of IX Standard Students" Edu Track Vol 12 No 9, 23-31*
9. *Tsang, Annetta Kit Lam (2011):" In class reflective group discussion as a strategy for the development of students as evolving professionals," International journal for the scholarship of teaching and learning: vol. 5, no.1, article 7*
10. *Hewitt, Elizabeth (2016) "Teachers thinking about a using peer group discussion in primary science*

11. *Crystal Chun Yun Lou (2006) "What effects does peer group study have on students learning in commerce mathematics? A case study of diverse ethnic learning. "*
12. *Sen Anindya, Goutam Prodyumna and Chatterjee Chirantan (2012):"Peer effect in graduate education: Evidence from India.''*
13. *Hulan Nancy (2010) "What the students will say while the teachers away: An investigation into student- led and teacher led discussion within guided reading groups."*
14. *Dr. Bala, Suman(2014)"Effect of concept mapping and reflective practice on concept construction of seventh class students. Research project report.*
15. *Dr. Chawla, Jaya & Dr. Sign Gurmeet (2015)" Effect of concept mapping strategy on achievement in chemistry among IX grader girls." International journal of informative and futuristic research. Vol 3.*

Bibliography

- *National curriculum framework (2005) New Delhi "National council of educational research and training."*
- *Riegler - Bridget Robinson, Riegler- Greg l Robinson (2008) "cognitive psychology applying the science of the mind." Pearson education publication.*
- *Ediger Marlow, Rao d Bhaskara (2006) "Scientific attitude vis- a-vis scientific aptitude." Published by discovery publishing house.*
- *Prof. Sood J K (2006) Teaching of science: Vinod Pustak Mandir*
- *Constructivist approach to teaching and learning: Hand book for teachers of secondary stage, NCERT, I – Edition*
- *Kapil H K (2012) Research method, Rakhi Prakashan*
- *Sharma & Dr, Parashar: "Science Teaching and Evaluation "Radha Prakashan*
- *Dr. Raizada B S "Necessary research elements in education," Rajasthan Hindi Granth Academy Jaipur*
- *Rai Parasnath (2010) "Research Introduction,".Laxmi Narayan Agrawal Publication"*
- *Mangal S K (2012) "Statistics in psychology in education" II – Edition PHI Learning Pvt.Ltd. New Delhi*
- *Best J W & J V Kahan (1989) "Research in Education" New Delhi, Prentice Hall of India Pvt. Ltd.*
- *Jeorge, P Susamma (2013) "Use of modern instructional strategies: awareness and achievement of student teachers at primary level. Shodh Ganga* http://hdl.handle.net/10603/6762

- *Sasidharan,P (2015)Influence of instructional learning strategies and classroom environment on achievement and retention in Malayan language of standard seventh pupils.* http://hdl.handle.net/10603/38797

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